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MEMORANDUM

DATE: 19 January 1999
TO: David Bennett, WAM, U.S. EPA, Region X
FROM: Michelle Turner, Chemist, WESTON, Seattle
Rnm Roger McGinnis, Senior Environmental Chemist, WESTON, Seattle

SUBJECT: Validation of Inorganics Data
Laboratory Batch:K9806550
Site: Duwamish River

WORK ASSIGNMENT NO . 46-23-0JZZ

WORK ORDER NO.: 4000-019-038-5200-00

DOC. CONTROL NO.: 4000-019-038-AAAK

cc: Bruce Woods, RAP-WAM, U.S. EPA, Region X
Dena Hughes, Site Manager, WESTON, Seattle (memo only)
Kevin Mundell-Jackson, Database Management, WESTON, Seattle

The quality assurance review of twenty sediment samples, laboratory batch K9806550, collected from the Duwamish River has been completed. The sediment samples were analyzed for inorganics by Columbia Analytical Services of Kelso, Washington using EPA Methods 200, 6010, 6020, and 7000 series as required to achieve detection limit goals. The samples were numbered:

98394000	98394001	98394002	98394003	98394004
98394005	98394006	98394007	98394008	98394009
98394010	98394011	98394012	98394013	98394014
98394015	98394016	98394017	98394018	98394019

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QA Review Batch K9806550 (Inorganics/Metals)

Site Duwamish River

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Data Qualifications

The following comments refer to the laboratory performance in meeting the quality control criteria described in the technical specifications of the laboratory subcontract. The review follows the format described in the U.S. EPA *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA OSWER 9240.1-05-01, February 1994) modified to include specific requirements of the analytical methods

1. Holding Times

Holding times of 28 days for mercury and six months for other metals (from date of collection to analysis) were established in the project Sampling and Analysis Plan. All samples met holding time criteria. Mercury samples were extracted 28 days after collection and analyzed two days after extraction

2. Calibration

a) Initial Calibration

Initial calibration frequencies and QC criteria were met for ICP and ICP/MS analyses.

Mass calibration for all ICP/MS internal standards was within 0.1 atomic mass unit of the true mass. ICP/MS resolution was less than 0.9 amu full width at 10 percent peak height.

b) CRI/CRA Standards

Instrument calibration was verified using low level standards near the project required detection limit

c) Initial and Continuing Calibration Verification

All inductively coupled plasma (ICP) and ICP/MS results met control limits of 90 to 110 percent recovery (percent R) of the true values for both initial and continuing calibration

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Site Duwamish River

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Mercury cold vapor AA (CVAA) results met control limits of 80 to 120 percent recovery (percent R) for both initial and continuing calibration

3. Instrument Detection Limits

All instrument detection limits (IDL) for ICP, ICP/MS, and mercury analyses met project requirements specified in the project Sampling and Analysis Plan.

4. Blanks

a) Laboratory Method Blanks

No analytes were detected in laboratory method blanks

b) Initial Calibration and Continuing Calibration Blanks

The following elements were found in calibration blanks.

Blank ID	Analyte	Concentration	Associated Samples
CCB1	Nickel	0.07 µg/L	98394000 through 98394004
CCB2	Cadmium	0.03 µg/L	98394002 through 98394004 (Reanalyses) 98394005 through 98394011
CCB3	Arsenic	0.1 µg/L	98394012 through 98394019 98394008 (Reanalysis) 98394009 (Reanalysis)
CCB3	Nickel	0.5 µg/L	98394012 through 98394019 98394008 (Reanalysis) 98394009 (Reanalysis)
CCB4	Arsenic	0.3 µg/L	none
CCB4	Nickel	0.63 µg/L	none

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Results for analytes listed above were qualified as undetected (UJ) if concentrations in associated samples were less than five times the concentration present in the blank.

c) Field Blanks

No field blank samples were associated with this laboratory batch.

5. ICP and ICP/MS Interference Check

*All analytes for the interference check samples were within the control limits of 80 to 120 percent of the true values Internal standard intensities for analytes determined by ICP/MS were within \pm 20 percent of the initial calibration intensity

6. Laboratory Control Sample

Laboratory control sample recoveries were within the QC limits (P-project, L-laboratory) for all analytes except the following.

Analyte	% Recovery	QC Limits
Antimony	143	80-120 (P) 20-180 (L)
Iron	150	80-120 (P) 43-157 (L)

Results for the above elements were qualified as estimated (J). Results were above the upper QC limit, indicating potential high bias.

7. Laboratory Duplicate Sample Analysis

Relative percent differences (RPD) between analytical results were within the QC limit of 35 percent (or \pm 2 times the quantitation limit for concentrations < 5 times the quantitation limit).

8. Spiked Sample Analysis

The matrix spike recoveries for the following analytes were outside QC limits:

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Sample	Analyte	Percent Recovery	QC Limits
98394000	Antimony	52	75-125

In addition, as the native sample concentrations for Aluminum and Iron exceeded the spike concentration by more than 4 times, recoveries were not calculated. Data were not qualified solely on matrix spike results

9 ICP and ICP/MS Serial Dilution

Serial dilutions were not routinely performed for this SDG.

10. ICP/MS Quality Control

a) Duplicate Analysis

Duplicate analyses were not performed for this SDG.

b) Post Digest Spike Recovery

Post digest spikes were not performed for this SDG.

c) Method of Standard Additions

No samples required MSA analysis.

d) ICP/MS Internal Standards

The intensity of all internal standards was within limits of 30 to 120 percent of the initial calibration intensity for all samples except the following:

Sample	Standard	% Intensity
98394002	Yttrium	125 2
98394003	Yttrium	128 9
98394004	Yttrium	126 9

Samples were diluted and reanalyzed as required

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10. Field Duplicate Analysis

No field duplicates were associated with this SDG.

11. Sample Analysis

A cursory raw data review was performed. All laboratory deliverables were present and complete. The case narrative indicated that the MS recovery of Antimony in sample 98394000 was outside the QC limits due to matrix effects. As associated QC was in control, no further action was taken. Also, the MS recovery of Aluminum and Iron were not calculated as the sample concentration was significantly higher than the added spike concentration. No other problems were noted

12. Laboratory Contact

No laboratory contact was required.

Data Assessment

Upon consideration of the data qualifications noted above, the data are ACCEPTABLE for use except where flagged with data qualifiers that modify the usefulness of the individual values.

Data Qualifiers

U - The material was analyzed for, but was not detected.

UJ - The analyte was not detected. The associated quantitation limit is an estimate because quality control criteria were not met.

J - The analyte was positively identified, but the associated numerical value is an estimated quantity because quality control criteria were not met or because concentrations reported were less than the CRDL or lowest calibration standard.

R - Quality control indicates that data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394000	Units	mg/Kg (ppm)
Lab Code	K9806550-001	Basis	Dry

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	15000	WS
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	
Arsenic	EPA 3050B	200 8	0.5	0.1	10	10/29/98	11/2/98	5.3	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	48	
Beryllium	EPA 3050B	200 8	0.02	0.02	10	10/29/98	11/2/98	0.26	
Cadmium	EPA 3050B	200 8	0.2	0.02	10	10/29/98	11/2/98	ND	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	4640	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	19	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	7	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	27	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	19300	J
Lead	EPA 3050B	200 8	0.02	0.004	10	10/29/98	11/2/98	7.01	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	4440	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	173	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.06	
Nickel	EPA 3050B	200 8	0.2	0.02	10	10/29/98	11/2/98	13.6	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	1600	
Selenium	EPA 3050B	200 8	1	0.3	10	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.02	0.004	10	10/29/98	11/3/98	0.05	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	6380	
Thallium	EPA 3050B	200 8	0.02	0.006	10	10/29/98	11/2/98	0.03	
Tin	EPA 3050B	200 8	2	0.05	10	10/29/98	11/2/98	4	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	60	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	42	

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7c Date 11/4/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394001	Units	mg/Kg (ppm)						
Lab Code	K9806550-002	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	18000	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	UJ
Arsenic	EPA 3050B	200 8	0 5	0 1	10	10/29/98	11/2/98	5 9	
Barium	EPA 3050B	6010B	1	0 6	2	10/29/98	11/3/98	69	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	10/29/98	11/2/98	0 31	
Cadmium	EPA 3050B	200 8	0 2	0 02	10	10/29/98	11/2/98	ND	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	5260	
Chromium	EPA 3050B	6010B	2	0 7	2	10/29/98	11/3/98	21	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	7	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	30	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	22400	J
Lead	EPA 3050B	200 8	0 02	0 004	10	10/29/98	11/2/98	6 62	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	5000	
Manganese	EPA 3050B	6010B	1	0 4	2	10/29/98	11/3/98	256	
Mercury	EPA 3050B	7471A	0 05	0 02	1	10/19/98	10/21/98	0 08	
Nickel	EPA 3050B	200 8	0 2	0 02	10	10/29/98	11/2/98	14 5	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	1800	
Selenium	EPA 3050B	200 8	1	0 3	10	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0 02	0 004	10	10/29/98	11/3/98	0 06	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	7070	
Thallium	EPA 3050B	200 8	0 02	0 006	10	10/29/98	11/2/98	0 08	
Tin	EPA 3050B	200 8	2	0 05	10	10/29/98	11/2/98	2	
Vanadium	EPA 3050B	6010B	2	0 6	2	10/29/98	11/3/98	66	
Zinc	EPA 3050B	6010B	2	0 8	2	10/29/98	11/3/98	47	

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394002	Units	mg/Kg (ppm)
Lab Code	K9806550-003	Basis	Dry
Test Notes			

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	25800	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	13	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	92	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.37	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	0.3	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	6370	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	33	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	11	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	57	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	32200	J
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	28.8	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	8240	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	355	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.17	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	24.7	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	2900	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	0.21	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	10600	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	5	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	76	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	115	

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COLUMBIA ANALYTICAL SERVICES, INC

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394003	Units	mg/Kg (ppm)
Lab Code	K9806550-004	Basis	Dry

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	26300	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0 4	20	10/29/98	11/2/98	14	
Barium	EPA 3050B	6010B	1	0 6	2	10/29/98	11/3/98	113	
Beryllium	EPA 3050B	200 8	0 08	0 08	20	10/29/98	11/2/98	0 41	
Cadmium	EPA 3050B	200 8	0 2	0 08	20	10/29/98	11/2/98	0 4	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	6550	
Chromium	EPA 3050B	6010B	2	0 7	2	10/29/98	11/3/98	34	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	11	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	72	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	33300	J
Lead	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/2/98	51 0-	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	8250	
Manganese	EPA 3050B	6010B	1	0 4	2	10/29/98	11/3/98	344	
Mercury	EPA 3050B	7471A	0 05	0 02	1	10/19/98	10/21/98	0 17	
Nickel	EPA 3050B	200 8	0 8	0 08	20	10/29/98	11/2/98	25 1	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3200	
Selenium	EPA 3050B	200 8	4	0 2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/3/98	0 45	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	10200	
Thallium	EPA 3050B	200 8	0 08	0 03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0 2	20	10/29/98	11/2/98	7	
Vanadium	EPA 3050B	6010B	2	0 6	2	10/29/98	11/3/98	77	
Zinc	EPA 3050B	6010B	2	0 8	2	10/29/98	11/3/98	140	

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06550ICP FAI Sample 11/4/98

Date 11/4/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394004							Units	mg/Kg (ppm)
Lab Code	K9806550-005							Basis	Dry
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	22200	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	UJ
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	12	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	81	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.33	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	0.3	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	21500	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	29	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	50	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	29000	J
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	30.3	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	7160	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	277	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.24	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	21.9	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	2600	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	0.28	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	9760	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	0.04	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	4	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	71	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	90	

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Approved By

Ellen

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06550ICP EA1 Sample (S) 12/8/98

Date 12/8/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394005	Units	mg/Kg (ppm)						
Lab Code	K9806550-006	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	23100	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0 4	20	10/29/98	11/2/98	11	
Barium	EPA 3050B	6010B	1	0 6	2	10/29/98	11/3/98	65	
Beryllium	EPA 3050B	200 8	0 08	0 08	20	10/29/98	11/2/98	0 33	
Cadmium	EPA 3050B	200 8	0 2	0 08	20	10/29/98	11/2/98	0 3	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	6100	
Chromium	EPA 3050B	6010B	2	0 7	2	10/29/98	11/3/98	28	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	46	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	30400	J
Lead	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/2/98	22 7	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	6920	
Manganese	EPA 3050B	6010B	1	0 4	2	10/29/98	11/3/98	257	
Mercury	EPA 3050B	7471A	0 05	0 02	1	10/19/98	10/21/98	0 25	
Nickel	EPA 3050B	200 8	0 8	0 08	20	10/29/98	11/2/98	21 2	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	2600	
Selenium	EPA 3050B	200 8	4	0 2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/3/98	0 17	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	8790	
Thallium	EPA 3050B	200 8	0 08	0 03	20	10/29/98	11/2/98	0 05	
Tin	EPA 3050B	200 8	2	0 2	20	10/29/98	11/2/98	4	
Vanadium	EPA 3050B	6010B	2	0 6	2	10/29/98	11/3/98	76	
Zinc	EPA 3050B	6010B	2	0 8	2	10/29/98	11/3/98	79	

WT/14/98

Approved By

15444ac/031695
K9806550IC P LAI Sample for 11/4/98

JC

Date 11/4/98

00013

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394006						Units	mg/Kg (ppm)	
Lab Code	K9806550-007						Basis	Dry	
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	22200	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	10	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	64	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.33	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	ND	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	6000	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	29	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	10	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	45	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	29200	J
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	172	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	7520	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	278	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.24	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	23.3	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	2600	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	0.14	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	8890	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	4	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	76	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	73	

WAT/14/99

Approved By _____
 144inc/011695
 06550IC P FA1 Sample (7) 11/4/98

Jc

Date 11/4/98 00014

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394007	Units	mg/Kg (ppm)						
Lab Code	K9806550-008	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	21600	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	8	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	76	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.32	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	ND	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	5680	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	26	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	40	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	27200	T
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	9.81	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	6450	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	304	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.15	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	19.7	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	2200	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	0.08	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	7710	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	7.0	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	3	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	76	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	59	

WT/19/98

Approved By

JC
1544mc/031695
06550(C P FA1 Sample (8) 11/4/98

Date 11/4/98 00015

P.L.S. No

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394008	Units	mg/Kg (ppm)
Lab Code	K9806550-009	Basis	Dry

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	28900	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	58	J
Arsenic	EPA 3050B	200 8	2	0 4	50	10/29/98	11/2/98	283	
Barium	EPA 3050B	6010B	1	0 6	2	10/29/98	11/3/98	247	
Beryllium	EPA 3050B	200 8	0 08	0 08	20	10/29/98	11/2/98	0 53	
Cadmium	EPA 3050B	200 8	0 2	0 08	20	10/29/98	11/2/98	1 1	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	28100	
Chromium	EPA 3050B	6010B	2	0 7	2	10/29/98	11/3/98	54	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	30	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	802	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	65200	J
Lead	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/2/98	303	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	10800	
Manganese	EPA 3050B	6010B	1	0 4	2	10/29/98	11/3/98	937	
Mercury	EPA 3050B	7471A	0 05	0 02	1	10/19/98	10/21/98	0 29	
Nickel	EPA 3050B	200 8	0 8	0 08	20	10/29/98	11/2/98	28 9	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3900	
Selenium	EPA 3050B	200 8	4	0 2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/3/98	0 85	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	10500	
Thallium	EPA 3050B	200 8	0 08	0 03	20	10/29/98	11/2/98	0 09	
Tin	EPA 3050B	200 8	2	0 2	20	10/29/98	11/2/98	35	
Vanadium	EPA 3050B	6010B	2	0 6	2	10/29/98	11/3/98	87	
Zinc	EPA 3050B	6010B	2	0 8	2	10/29/98	11/3/98	1560	

WGT/14/99

Approved By

1544mc/031095

06550K P.L.A.T. Sample (9) 11/4/98

J

Date

11/4/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394009						Units	mg/Kg (ppm)	
Lab Code	K9806550-010						Basis	Dry	
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	29100	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	148	J
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	622	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	636	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.56	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	1.6	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	17000	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	88	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	40	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	720	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	56100	J
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	625	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9480	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	588	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	1.44	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	37.8	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3800	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	1.29	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	10100	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	0.16	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	46	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	81	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	1410	

WAT/1/499

Approved By

1544mc/031695
065501C P EA1 Sampl. (10) 11/4/98*JF*

Date 11/4/98

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COLUMBIA ANALYTICAL SERVICES, INC

Analytical Report

Client: Roy F Weston, Inc
Project: Duwanush River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394010	Units	mg/Kg (ppm)						
Lab Code	K9806550-011	Basis	Dry						
Test Notes									
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	27300	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0 4	20	10/29/98	11/2/98	14	
Barium	EPA 3050B	6010B	1	0 6	2	10/29/98	11/3/98	114	
Beryllium	EPA 3050B	200 8	0 08	0 08	20	10/29/98	11/2/98	0 39	
Cadmium	EPA 3050B	200 8	0 2	0 08	20	10/29/98	11/2/98	0 4	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	25800	
Chromium	EPA 3050B	6010B	2	0 7	2	10/29/98	11/3/98	36	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	11	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	82	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	35300	TC
Lead	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/2/98	60 4	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9120	
Manganese	EPA 3050B	6010B	1	0 4	2	10/29/98	11/3/98	390	
Mercury	EPA 3050B	7471A	0 05	0 02	1	10/19/98	10/21/98	0 23	
Nickel	EPA 3050B	200 8	0 8	0 08	20	10/29/98	11/2/98	27 0	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3400	
Selenium	EPA 3050B	200 8	4	0 2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/3/98	0 50	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	11500	
Thallium	EPA 3050B	200 8	0 08	0 03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0 2	20	10/29/98	11/2/98	8	
Vanadium	EPA 3050B	6010B	2	0 6	2	10/29/98	11/3/98	79	
Zinc	EPA 3050B	6010B	2	0 8	2	10/29/98	11/3/98	152	

WGT, 1/4/99

11/4/98

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Approved By

TS44mc/031695
065501CP(LAI) Sample (11) 11/4/95

Date

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/21/98
Date Received: 9/22/98

Total Metals

Sample Name	98394011		Units	mg/Kg (ppm)					
Lab Code	K9806550-012		Basis	Dry					
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	27100	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	16	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	102	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.41	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	1.4	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	18500	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	52	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	11	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	81	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	33500	T
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	71.1	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	8820	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	348	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.75	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	23.4	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3600	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	1.99	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	12100	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	6	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	79	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	146	

WT, 1/4/99

Approved By

TS 14me/031695
K9806550-P1-A1 Sample (12) 11/1/98*JC*

Date 11/4/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/22/98
Date Received: 9/23/98

Total Metals

Sample Name	98394012	Units	mg/Kg (ppm)
Lab Code	K9806550-013	Basis	Dry

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	30200	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	18	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	157	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.46	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	11	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	9430	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	41	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	11	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	114	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	37600	WT
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	128	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9480	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	403	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.38	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	26.7	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3800	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	0.91	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	12000	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	11	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	84	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	302	

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Approved By

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06550IC P LA1 Sample (13) 11/4/98

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Page No

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/22/98
Date Received: 9/23/98

Total Metals

Sample Name	98394013						Units	mg/Kg (ppm)	
Lab Code	K9806550-014						Basis	Dry	
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	33000	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	6	(J)
Arsenic	EPA 3050B	200 8	2	0 4	20	10/29/98	11/2/98	24	
Barium	EPA 3050B	6010B	1	0 6	2	10/29/98	11/3/98	216	
Beryllium	EPA 3050B	200 8	0 08	0 08	20	10/29/98	11/2/98	0 44	
Cadmium	EPA 3050B	200 8	0 2	0 08	20	10/29/98	11/2/98	3 7	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	10600	
Chromium	EPA 3050B	6010B	2	0 7	2	10/29/98	11/3/98	69	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	12	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	132	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	39400	J
Lead	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/2/98	222	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9940	
Manganese	EPA 3050B	6010B	1	0 4	2	10/29/98	11/3/98	454	
Mercury	EPA 3050B	7471A	0 05	0 02	1	10/19/98	10/21/98	0 64	
Nickel	EPA 3050B	200 8	0 8	0 08	20	10/29/98	11/2/98	32 9	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3900	
Selenium	EPA 3050B	200 8	4	0 2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0 08	0 02	20	10/29/98	11/3/98	2 58	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	13400	
Thallium	EPA 3050B	200 8	0 08	0 03	20	10/29/98	11/2/98	0 11	
Tin	EPA 3050B	200 8	2	0 2	20	10/29/98	11/2/98	22	
Vanadium	EPA 3050B	6010B	2	0 6	2	10/29/98	11/3/98	92	
Zinc	EPA 3050B	6010B	2	0 8	2	10/29/98	11/3/98	634	

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Approved By

1544Inc/031695
06550RCPFA1 - Sample (1) 11/4/98

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Date 11/4/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/22/98
Date Received: 9/23/98

Total Metals

Sample Name	98394014		Units	mg/Kg (ppm)						
Lab Code	K9806550-015		Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes	
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	15700		
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	9	(J)	
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	19		
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	82		
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.16		
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	2.5		
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	7020		
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	51		
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9		
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	192		
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	24600	J	
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	436		
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	7150		
Manganese	--	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	234	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.92		
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	33.4		
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	1900		
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND		
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	1.50		
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	9460		
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	ND		
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	20		
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	57		
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	420		

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Approved By

1544mc/031695
K9806550-K PFAI Sample 035 11/4/98

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Date 11/4/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/22/98
Date Received: 9/23/98

Total Metals

Sample Name	98394015						Units	mg/Kg (ppm)	
Lab Code	K9806550-016						Basis	Dry	
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	21400	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	26	J
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	13	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	91	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.29	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	30	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	7550	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	61	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	129	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	28200	J
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	483	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	6940	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	285	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.61	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	277	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	2500	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	3.03	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	8950	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	16	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	69	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	258	

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06550ICP CA1 Sample (16) 11/4/98

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Date 11/4/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/22/98
Date Received: 9/23/98

Total Metals

Sample Name	98394016	Units	mg/Kg (ppm)						
Lab Code	K9806550-017	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	29800	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	11	J
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	44	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	351	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.43	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	0.5	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	8120	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	41	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	14	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	139	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	43300	J
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	122	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9550	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	453	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.23	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	26.4	
Potassium	EPA 3050B	6010B	~ 400	400	2	10/29/98	11/3/98	3900	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	0.55	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	11500	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	9	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	79	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	296	

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Approved By _____ *[Signature]* Date 11/4/98 00024
 1544mc/031695
 06550IC P1 AT Sample (17) 11/4/98

Print No

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/22/98
Date Received: 9/23/98

Total Metals

Sample Name	98394017		Units	mg/Kg (ppm)					
Lab Code	K9806550-018		Basis	Dry					
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	28900	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	12	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	92	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.43	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	0.3	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	7050	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	35	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	12	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	56	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	37000	J
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	26.2	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9590	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	384	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.17	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	25.8	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3600	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	0.19	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	13500	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	4	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	85	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	119	

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1544mc/031e95
06550IC P1 A1 Sample (18) 11/4/98

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Date 11/4/98

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Print No

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/22/98
Date Received: 9/23/98

Total Metals

Sample Name	98394018						Units	mg/Kg (ppm)	
Lab Code	K9806550-019						Basis	Dry	
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	28600	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	20	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	93	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.43	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	0.6	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	6990	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	34	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	11	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	78	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	37300	J
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	46.4	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	9180	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	368	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.18	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	23.2	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3600	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	0.67	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	13600	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	0.04	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	5	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	83	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	193	

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Approved By

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K9806550 (P.F.A.) Sample (19) 11/4/98

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Date 11/4/98

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Roy F Weston, Inc
Project: Duwamish River/4000-027-001-2019-38
Sample Matrix: Sediment

Service Request: K9806550
Date Collected: 9/22/98
Date Received: 9/23/98

Total Metals

Sample Name	98394019		Units	mg/Kg (ppm)					
Lab Code	K9806550-020		Basis	Dry					
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	24200	
Antimony	EPA 3050B	6010B	10	5	2	10/29/98	11/3/98	ND	WT
Arsenic	EPA 3050B	200 8	2	0.4	20	10/29/98	11/2/98	7	
Barium	EPA 3050B	6010B	1	0.6	2	10/29/98	11/3/98	72	
Beryllium	EPA 3050B	200 8	0.08	0.08	20	10/29/98	11/2/98	0.32	
Cadmium	EPA 3050B	200 8	0.2	0.08	20	10/29/98	11/2/98	ND	
Calcium	EPA 3050B	6010B	10	3	2	10/29/98	11/3/98	6520	
Chromium	EPA 3050B	6010B	2	0.7	2	10/29/98	11/3/98	29	
Cobalt	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	10	
Copper	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	41	
Iron	EPA 3050B	6010B	4	4	2	10/29/98	11/3/98	30400	J
Lead	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/2/98	213	
Magnesium	EPA 3050B	6010B	2	2	2	10/29/98	11/3/98	7970	
Manganese	EPA 3050B	6010B	1	0.4	2	10/29/98	11/3/98	300	
Mercury	EPA 3050B	7471A	0.05	0.02	1	10/19/98	10/21/98	0.10	
Nickel	EPA 3050B	200 8	0.8	0.08	20	10/29/98	11/2/98	228	
Potassium	EPA 3050B	6010B	400	400	2	10/29/98	11/3/98	3000	
Selenium	EPA 3050B	200 8	4	0.2	20	10/29/98	11/2/98	ND	
Silver	EPA 3050B	200 8	0.08	0.02	20	10/29/98	11/3/98	0.13	
Sodium	EPA 3050B	6010B	20	20	2	10/29/98	11/3/98	11700	
Thallium	EPA 3050B	200 8	0.08	0.03	20	10/29/98	11/2/98	ND	
Tin	EPA 3050B	200 8	2	0.2	20	10/29/98	11/2/98	4	
Vanadium	EPA 3050B	6010B	2	0.6	2	10/29/98	11/3/98	77	
Zinc	EPA 3050B	6010B	2	0.8	2	10/29/98	11/3/98	100	

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Approved By

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